

REMARKS/ARGUMENTS

This Amendment and the following remarks are intended to fully respond to the Office Action mailed April 21, 2006. In that Office Action claims 21-53 were examined, and all claims were rejected. More specifically, claims 21-53 were rejected under 35 U.S.C. § 101 because the invention is directed to non-statutory subject matter; claims 21-53 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,553,398, and claims 1-16 of U.S. Patent No. 6,735,603; claims 21-37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mann et al. (USPN 5,996,089) in view of Edward K. Lee et al. "Petal: distributed virtual disks"; and claims 38-53 were rejected under 35 U.S.C. § 102(e) as being anticipated by Erlichson et al. (USPN 5,875,468).

In this Amendment, claims 21, 30, 38, and 46 have been amended. No claims have been canceled, or added. Based on the foregoing amendments and following remarks, reconsideration and further Examination are respectfully requested.

Claim Rejections – 35 U.S.C. § 101

The Examiner rejects claims 21-53, asserting that the claims recite an invention that fails to have a tangible result in accordance with the requirements of 35 U.S.C. § 101 (statutory subject matter). See *Office Action* (4/21/06), page 5. Specifically, the Examiner states that there is no practical real-world result produced by the invention as claimed. The Applicants respectfully submit that the newly amended claims are properly directed to statutory subject matter. Prior to addressing the substance of these rejections, the current legal standards for patentability under 35 U.S.C. §101 are summarized below.

To be patentable, a computer-related process must either (1) result in a physical transformation outside the computer, or (2) be limited by the language in the claim to a practical application within the technological arts. See *Diamond v. Dier*, 450 U.S. 175, 183-84, 209 U.S.P.Q. 1, 6 (1981); MPEP § 2106(b). The first type of patentable subject matter (a physical transformation outside the computer) "is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application." *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1358, 50 USPQ2d 1447, 1452 (Fed. Cir. 1999). The

second type of patentable subject matter (a practical application within the technological arts) has been defined as an invention, which produces “a useful, concrete and tangible result.” *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 47 U.S.P.Q 2d 1596, 1600-01 (Fed. Cir. 1998), cert. denied, 525 U.S. 1093 (1999). For purposes of U.S. Patent Office practice, “the tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing.” *Interim Guidelines for Examination of Patent Applications For Patent Subject Matter Eligibility*, § IV.C.2b(2).

Turning now to the claims, independent claims 21, 30, 38, and 46 have been amended to recite “wherein the configuration status indicates whether the first logical volume can be exposed as on line.” Support for this amendment can be found at least in originally filed claims 5, 6, 18 and 19; Detailed Description page 20, lines 3-11; and Detailed Description page 24, lines 12-17. With respect to the “real-world result” (i.e., the concrete tangible result required by *State Street Bank*) Applicants submit that the Detailed Description makes clear the useful, concrete, and tangible nature of exposing a volume as on line. On page 12, line 17, the Detailed Description states that exposing a volume as on line makes it “available to a file system or other data store.” In other words, a user or software application can access the volume to store and retrieve information. As another example, the Detailed Description states that exposing a volume as on-line, “makes the volume available for use by the operating system and applications desiring to use the volume.” *Detailed Description*, page 20, line 10-11. Applicants note that a volume is an abstraction of underlying physical storage devices (e.g. RAID). *See Background*, page 2, lines 10-14. Thus, making a volume available for use, actually translates to making a storage device available for storage of information by users or software applications. Accordingly, exposing a volume as on line has a useful, concrete and tangible result, namely providing storage devices to users or applications for storage or access of information. For at least these reasons, the system claimed in newly amended claims 21, 30, 38, and 46 is directed to patentable subject matter by way of limitation to a practical application within the technological arts by virtue of producing a useful, concrete and tangible result.

Claims 22-29, 31-37, 39-45, and 47-51 depend from base claims 21, 30, 38, and 46, respectively, and include all of the limitations of the base claim. Accordingly, each of claims 22-

29, 31-37, 39-45, and 47-51 are also directed to statutory subject matter for the same reasons described above with respect to claims 21, 30, 38, and 46.

Claim Rejections – Double Patenting

Claims 21-53 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,553,387, and claims 1-16 of U.S. Patent No. 6,735,603. Enclosed herewith is a terminal disclaimer, which obviates this rejection. The Applicants respectfully request that withdrawal of this rejection.

Claim Rejections – 35 U.S.C. § 103

Claims 21-37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mann et al. (USPN 5,996,089) hereinafter “Mann,” in view of Edward K. Lee et al. “Petal: distributed virtual disks,” hereinafter “Lee.” Applicants respectfully traverse this rejection.

Generally, in embodiments, the present invention relates to associating epoch number (identifiers) with volume extents, for maintaining volume consistency. Each time a volume configuration change is made, the epoch number is incremented in all of the currently online extents. When a disk volume is discovered by a logical volume manager, the logical volume manager compares the epoch number on the extents to determine a configuration status of the volume. The configuration status indicates whether a volume can be exposed as online, and made available for use. As one example, if the epoch numbers are not consistent across a volume, then at least one extent contains stale data, and in some embodiments the volume is not exposed as online. However, in other embodiments, if the volume can be reconstructed without any data corruption, the volume may be exposed as online.

In contrast to embodiments of the present invention, Mann describes a method for “redundantly storing data in a distributed computer system having at least three processor systems.” *Mann*, col. 2, lines 20-21. Each of the processor systems has a central processing unit and at least one mass storage sub-system. Mann discloses “interconnecting each one of the processor systems in a point to point two way channel interconnection with each of the other processor systems, and storing input data across the processor systems according to a distributed, redundant storage process.” *Id.* at col. 2, lines 24-28. In the absence of a failure of any of the

processor systems the load is balanced across the processor systems. *Id.* at col. 2, lines 37-41. In the presence of a failure of one of the processor systems, redundant data is read from a non-failed processor system in place of the data stored at the failed processor system. *See Id.* at col. 2, lines 41-47. In sum, Mann is directed at data redundancy and load balancing, and not volume consistency, like embodiments of the present invention.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *Manual of Patent Examining Procedure* (MPEP) § 706.02(j) (*citing In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). The Applicants respectfully submit that the Examiner has not met the burden of establishing a *prima facie* case of obviousness, because the combination of Mann and Lee do not disclose all the elements of the newly amended claims.

Firstly, Applicants note that claims 21 and 30 each indicate that the epoch identifiers are compared to determine a configuration status. Although the Examiner indicates that this element is disclosed by Mann at col. 7, lines 15-29, Applicants kindly submit that the language cited by the Examiner does not disclose this element. The language describes the use of data objects in cluster volumes as a way of allowing members of a cluster to keep their file systems private. Mann teaches that “[s]ince the cluster members keep their file system private and only export access to the data objects, each cluster member can read, write, or delete files from its local file system without disrupting the other members of the cluster.” *Mann*, col. 7, lines 15-29. However, this is not the same as comparing epoch identities to determine a configuration status, as recited in claims 21 and 30. Furthermore, Applicants also respectfully point out that the Examiner appears to concede that Mann does not teach epoch identities (*Office Action*, page 9-10), and therefore it cannot teach comparing the epoch identities to determine a configuration status.

Moreover, as described above, claims 21 and 30 have been amended to recite that the configuration status indicates whether the first logical volume can be exposed as on line. Applicants politely submit that Mann does not teach or suggest this newly added element of claims 21 and 30. As described above, Mann is directed at entirely different processes, namely

load balancing and data redundancy, and therefore would not, and does not, teach or suggest the use of epoch identifiers to determine a configuration status, which is used to determine whether a volume is exposed as on line.

The Lee reference cited by the Examiner does not compensate for the deficiencies in Mann. For at least these reasons, claims 21 and 30 are allowable over the combination of Mann and Lee. Additionally, claims 22-29 and 31-37 depend from base claims 21 and 30, respectively, and include all of the limitations of the base claim. Accordingly, each of claims 22-29 and 31-37 are allowable over the disclosures of Mann and Lee for at least the same reasons described above with respect to claims 21 and 30.

Claim Rejections – 35 U.S.C. § 102

Claims 38-53 were rejected under 35 U.S.C. § 102(e) as being anticipated by Erlichson et al. (USPN 5,875,468) hereinafter Erlichson. Applicants respectfully traverse the rejection.

Erlichson describes a method of hiding part of the latency associated with write operations in computer systems that have multiple caches with a combination of multiple processors sharing a cache (both hardware and software controlled). *See Erlichson*, col. 4, lines 45-47. Erlichson describes that a write stream to each cache is dynamically divided into separate intervals or epochs. *See Id at* col. 4, lines 51-52. The epochs are demarcated by synch operations: a synch ends the old epoch and begins a new one. When a write miss is detected in a cache, a counter corresponding to the current epoch is incremented. When the write miss globally completes, the epoch counter is decremented. Erlichson teaches that the synch operations wait until all previous epochs, up to and including the one that was active before the synch, have zero misses pending within them. *See Id at* col. 4, lines 57-60.

A claim is anticipated only if each and every element as set forth in the claim is found, expressly or inherently described, in a single prior art reference. *See MPEP* 2131 (*citing Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). The identical invention must be shown in as complete detail as is contained in the claim. *See Id. (citing Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)).

Applicants respectfully submit that Erlichson does not teach or suggest all the elements of claims 38 and 46. *Inter alia*, the claims recite, reading an epoch value from each extent of a

logical volume. Although the Examiner asserts that this limitation is disclosed by Erlichson, Applicants point out that there is no mention of volume extents in Erlichson at all, much less reading an epoch value from each extent of a logical volume. The language cited by the Examiner as disclosing this element states as follows:

The data structures used by the epoch controller 506 are shown in FIG. 6. The epoch controller on each node contains a ring of outstanding-miss counters, 601-604. The number of counters is equal to the number of processors on the node plus one. The epoch and cache controller 506 provide for early retirement of write misses as follows. In the present invention, a processor write stream is divided into ordered epochs, demarcated by synch operations. Each of these epochs are assigned a rotating interval identification number. Write misses to the cache are assigned the identification number of the current epoch, shown in 605.

Erlichson, col. 6, lines 30-40. As is evident, this language does not teach or suggest reading a epoch value from each extent of a logical volume. Furthermore, Erlichson makes clear that the nodes are not extents of a logical volume, rather the nodes “include one cache and one or more processors.” *Id.* at col. 5, lines 53-54. For this reason alone, claims 38 and 46 are allowable over Erlichson.

In addition, claims 38 and 46 have been amended to recite that the configuration status indicates whether the first logical volume can be exposed as on line. Erlichson does not disclose this element of newly amended claims 38 and 46, and for this additional reason, Erlichson does not anticipate claims 38 and 46.

Claims 39-45 and 47-53 depend from base claims 38 and 46, respectively, and include all of the limitations of the base claim. Accordingly, each of claims 39-45 and 47-53 are allowable over the teaching of Ehrlichson for at least the same reasons described above with respect to claims 38 and 46.

Conclusion

This Amendment fully responds to the Final Office Action mailed on April 21, 2006. Still, that Office Action may contain arguments and rejections and that are not directly addressed by this Amendment due to the fact that they are rendered moot in light of the preceding arguments in favor of patentability. Hence, failure of this Amendment to directly address an argument raised in the Office Action should not be taken as an indication that the Applicant believes the argument has merit. Furthermore, the claims of the present application may include other elements, not discussed in this Amendment, which are not shown, taught, or otherwise suggested by the art of record. Accordingly, the preceding arguments in favor of patentability are advanced without prejudice to other bases of patentability.

Please charge Deposit Account No. 13-2725 the amount of \$130 to cover the fee for a Terminal Disclaimer. It is believed that no other fees are due with this Response. However, the Commissioner is hereby authorized to charge any deficiencies or credit any overpayment with respect to this patent application to deposit account number 13-2725.

In light of the above remarks and amendments, it is believed that the application is now in condition for allowance and such action is respectfully requested. Should any additional issues need to be resolved, the Examiner is requested to telephone the undersigned to attempt to resolve those issues.

Respectfully submitted,

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